Development of a strategic management model to enhance the effectiveness of the cooperation between private companies and vocational colleges, China

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Abstract: China's transition from Made in China to "Created in China" underscores the urgency of effective school-enterprise cooperation to cultivate innovation-ready talent. Despite policy emphasis on industry-education integration, fragmented governance, misaligned incentives, and low enterprise engagement persist, reflecting gaps in both theory and practice. Grounded in stakeholder theory and collaborative governance frameworks, using a mixed-methods approach, data were collected from private enterprises and vocational colleges across diverse regions in China, employing a validated questionnaire to assess collaboration models, strategic alignment, and outcomes. The usable sample size was n=193 respondents. Furthermore, findings reveal that innovation-centric models, such as Industry-Academic-Research Integration, exert the strongest influence on partnership success, while strategic coherence defined as aligned objectives and adaptive governance emerges as a critical mediator between collaborative processes and outcomes. Modern apprenticeships demonstrate moderate efficacy, particularly in sectors with stable skill demands, whereas demographic factors show negligible impacts. The study's novelty lies in its stratified, context-sensitive model, which diverges from rigid international frameworks by accommodating regional economic disparities and sectoral heterogeneities. By integrating institutional theory with practical governance mechanisms.

Keywords: Collaborative governance, Industry-education integration, School-enterprise cooperation, Strategic coherence, Vocational education reforms.

1. Introduction

Since the reform and opening up, China's vocational education has made remarkable progress but still faces challenges [1]. School-enterprise cooperation has evolved, closely linked to economic restructuring and industrial upgrading. The Chinese government has promoted such cooperation since the 1990s [2]. However, market-oriented reforms and enterprises' profit-seeking nature have caused separation and alienation between schools and enterprises. Recently, the state has emphasized policy support and institutional innovation [3]. Cooperation models have diversified, but there is room for improvement. As China transitions from "Made in China" to "Created in China," the demand for high-quality technical personnel has risen, highlighting the importance of effective cooperation [4].

In the global field of vocational education, cooperation between private companies and educational institutions exhibits diverse characteristics and challenges [5]. In vocational education, cooperation between companies and educational institutions faces challenges. Germany's "dual system" needs more company participation Qian [6] while Japan faces higher demands due to global competition [7]. Australia's TAFE has high satisfaction but faces investment and course-market connection issues [8]. High-quality vocational education needs deeper school-enterprise cooperation and industry-education integration. Issues like imperfect mechanisms, low enterprise participation, and lacking innovative

modes disconnect education from market demands. Stakeholder theory addresses these by balancing interests, clarifying rights and obligations, and establishing benefit distribution mechanisms [9]. Policies like the Integration Plan aim to promote integration [10]. Thus, a stakeholder-based model is crucial for solving problems and promoting high-quality development, facilitating harmonious interest relations and long-term integration.

Progressive changes in China's vocational education environment require new partnership systems which move past standard commercial agreements [11]. The stakeholder theory support for balancing education with corporate objectives but fails to study these institutional and organizational and operational challenges as interconnected system barriers instead of individual elements [12]. Research on the effects of vocational colleges' extended educational cycle durations against enterprises' profit-first mindset shows limited analysis of the systemic governance issue created by industrial development and policy execution differences at the regional level [13]. Current frameworks ignore how various types of private enterprises differ in their preferences because multinational corporations and SMEs and tech start-ups exhibit different collaborative interests either through R&D co-creation or standardized training [11]. Existing oversight hinders the extension of partnership models throughout various industrial sectors and international locations especially in China's digital economy which demands quick response and innovative talent development for new sectors including artificial intelligence and green energy [14]. Using institutional theory and resource dependency perspectives as foundations the research examines the role of macro policy incentives and micro-level stakeholder behavior and organizational practices on enabling or limiting partnership cooperation. The study integrates information from executives and officials at vocational colleges together with corporate leaders to find important junctures for systematic change through interviews and workshops. The three essential elements which involve the government's mediation role in sharing collaboration risks and the importance of digital platforms for symmetrical communication and adaptive accreditation systems that match up with industry requirements.

The research adds value to discussions about industry-education cooperation through a multifaceted strategic management framework which combines top-level coordinated policies and operational flexibility at lower levels. The model introduces adaptive governance systems for handling local economic targets and business development stages together with institutional capabilities while rejecting basic structure-based frameworks. The study expands transitional economy cross-sector collaboration research by unraveling the complex system between regulatory frameworks and organizational initiatives and stakeholder trust development mechanisms. This research serves as a basis for transforming vocational education success indicators from restricted internship targets towards positive changes that include co-developed curriculum content and shared expertise and durable talent systems. The study uses this research to transform school-enterprise cooperation beyond mere policy instrument to become a driver for China's post-industrial socioeconomic evolution. Developing an efficient and scientific strategic management model to enhance the cooperation between private enterprises and vocational colleges is crucial for promoting industrial upgrading, improving talent quality, and ensuring the in-depth integration of industry and education. Based on this, the research objectives of this study are shown below:

1. To explore the factors affecting the effectiveness of cooperation between private companies and vocational colleges.
2. To provide effective management strategies to Enhance the Effectiveness of the cooperation between private companies and vocational colleges.

2. Literature Review

2.1. Private Companies Cooperation in Vocational Education

With economic growth and specialized labor demands, vocational education focuses on skills and competencies [7, 15]. Technical schools and vocational high schools offer tailored programs. China's vocational education has evolved, encompassing science, technology, and lifelong development [16, 17].

School-enterprise cooperation in vocational education lacks a unified definition. Definitions include combining in-school learning with practical experience [18, 19] and vocational institutions collaborating with enterprises for talent cultivation and consulting [3, 20]. This paper defines it as a model where the government, vocational institutions, and enterprises jointly improve education and training quality. Integration of industry and education is vital for national development China's vocational education enrolls millions, but faces issues like low enterprise participation and a talent-market mismatch [21, 22]. Policies like the Implementation Plan promote cooperation. Over 1,500 vocational groups exist, with government incentives piloting integration in enterprises and cities [23, 24]. However, challenges include disconnects between teaching and production, impacting student alignment with enterprise needs.

Research focuses heavily on private company involvement in vocational education because nations need to connect their workforce training to fast-moving industrial changes. Research shows that private institutions participate in vocational education to acquire qualified personnel while decreasing hiring expenses and promoting innovation through cooperation on research and development projects [25]. The research shows educational institutions still face two main difficulties originating from corporate profit motives pushing against institutional public values and unbalanced decision-making power dynamics that curb vocational college advancement [26]. The dual apprenticeship system of Germany has received worldwide praise yet stagnates due to excessive bureaucracy and high operational costs that scare off corporate partners [27]. Similarly, China faces regulatory inconsistencies and administrative division between its centralized state and regional markets. Stakeholder theory and institutional logics together serve as analytical frameworks for understanding these competing objectives which can be resolved through mechanisms that integrate shared governance structures together with performance-linked funding [28]. The evaluation of sector-specific elements affecting collaborative effectiveness between businesses and academic institutions remains incomplete specifically within emerging economies that experience fast digital growth. Resource dependency theory demonstrates why enterprises select colleges for human capital development yet fails to address conflicts that arise through cultural differences between organizations [29].

2.2. Effective Models of Private Companies Cooperation in Vocational Education
2.2.1. Order-based Talent Training Model

The order-based talent cultivation model involves enterprises partnering with vocational colleges to tailor teaching programs based on talent needs, fostering a win-win scenario [7]. This innovative approach, unlike the traditional model hindered by outdated concepts, includes enterprise participation in education planning and assessment. Cooperation is based on a tripartite agreement. Two operational models exist: the "1+2" model, where students study basics in the first year and practice aligned with enterprise needs in the next two, and the full-process model, deeply involving enterprises in enrollment, teaching, management, and internships. This ensures graduates are directly employed, with targeted learning and quick workplace adaptation, achieving tripartite satisfaction [19].

Private companies utilize the order-based talent training model which Germany applies through its dual system and Chinese modern apprenticeship programs to order vocational college graduates who receive training specifically for their operational requirements [23]. Enterprises join forces with colleges through their shared involvement in the development of curricula and joint workshop delivery and evaluation of student skills which focus on particular professional roles and technological specifications [30]. Siemens along with Huawei have led the development of these collaborative programs by incorporating their proprietary systems directly into educational curricula and providing interns access to future employment. The workforce-oriented educational model lowers recruitment expenses for businesses yet draws criticism because short-term forecasts can produce graduates who lack industry adaptability [31]. The educational learning goals face an indeterminate impact when businesses exploit their power advantage to select agile skills that might weaken future curricular advancement [17]. Through structured enterprise evaluations the model demonstrates its ability to link

educational adjustments with businesses' input while addressing skill shortages in markets where demand remains stable such as healthcare and advanced manufacturing [32]. The model proves ineffective in industries that require quick adaptation to continuously changing skills because it needs additional flexible frameworks for successful implementation.

2.2.2. Modern Apprenticeship Model

The modern apprenticeship model, popular in China's industrial sectors, emphasizes deep college-enterprise cooperation [33]. Launched nationwide in 2016, it integrates theoretical teaching with practical guidance, achieving seamless production-education integration. Curricula are optimized for enterprise needs, ensuring students master knowledge and skills. It fosters lifelong learning and integrates enrollment and employment through a dual-mentor system and tripartite agreement, enhancing cooperation [34].

These are the modern apprenticeship models that are an evolution of the traditional vocational training systems which adopt the mixed mode of classroom based theoretical instruction and workplace based practical learning site integrated under the framework of structured partnerships between the vocational colleges and private companies [35]. Based on Germany's dual system but customized to China's state guided market context, it features co governance, wherein enterprises are an active partner in curriculum design, mentor programs and competency certification [14, 36]. For instance, Bosch and Foxconn have sworn apprenticeships in mechatronics and smart manufacturing with vocational institutions and sample the students between academic study and paid on site working out the jobs. They support that this model connects the theory and practice divide and improves graduate employability along with fostering loyalty between apprentices and firms [37]. There are still problems, such as high cost for SMEs to maintain long term apprenticeships, uneven quality of the company in-mentor, and the regulation ambivalence for the standardization of the certification on the regional level. Apprenticeship frameworks, as critics also observe, may be unable to keep up with rapid technological changes, especially in digital sectors where skill demands are dynamically increasing and skill obsolescence occurs faster than curriculum can be updated [38].

2.2.3. Industry-Academic-Research Integration Models

The Industry-Academic-Research (IAR) model links industry, universities, and research institutions to drive innovation and talent cultivation [39]. It combines market orientation, research capabilities, and technology to transform scientific achievements into industrial applications, promoting upgrades and cultivating talents [40]. Cooperation includes joint R&D, technology transfer, consulting, and talent agreements, enhancing knowledge exchange). Effective cooperation needs clear goals, shared interests, and supportive policies. Challenges include interest coordination, intellectual property management, and fostering a collaborative culture, requiring rules, legal protection, and trust-building [41]. The IAR model potentially bridges academia, industry, and research for economic and social development.

The industry-academic-research integration model establishes a high-level partnership structure that unites private companies and vocational colleges and research institutions for talent education and technological innovation and applied research purposes into a knowledge co-creation system [6]. The integration model demonstrated through Huawei-Shenzhen Polytechnic 5G R&D and BYD-vocational college new energy vehicle innovation shows how businesses take possession of educational value sequencing from curriculum preparation to research findings commercialization [36, 42]. The integration of vocational training with industry problems helps students perform practical work on real projects and provides businesses access to specialized talent which leads to cost-effective R&D efforts and faster market access. The model encounters multiple issues because academic institutions and companies fail to agree on IP ownership and academic research completes at different times than company product release schedules besides showing resource inequality where large corporations benefit more than small and medium enterprises [38, 43]. The limited funds available to SMEs prevent

them from supporting prolonged R&D collaborations alongside the vocational colleges which give preference to publishable scholarly work instead of business-oriented solutions [41]. The recently implemented governmental funding mechanisms and standardized IP sharing models [31].

2.3. Research Hypotheses and Conceptual Framework

Hypothesis 1: There is a significant effect of the model of cooperation between private companies and vocational colleges on the effectiveness of their cooperation

Hypothesis 2: There is a significant effect of order-based talent training model on strategic alignment

Hypothesis 3: Modern apprenticeship models have a significant impact on strategic alignment

Hypothesis 4: There is a significant effect of industry-academia-research integration model on strategic coherence

Hypothesis 5: There is a significant effect of strategic congruence on the effectiveness of cooperation between private companies and vocational colleges and universities

Hypothesis 6: Strategic coherence has a significant effect on the effectiveness of cooperation objectives

Hypothesis 7: Strategic coherence has a significant effect on the effectiveness of the cooperation process

Hypothesis 8: There is a significant effect of strategic coherence on the effectiveness of cooperation outcomes

Hypothesis 9: Strategic congruence mediates the effect of the model of cooperation between private companies and vocational colleges on the effectiveness of their cooperation. The conceptual framework is as follows:
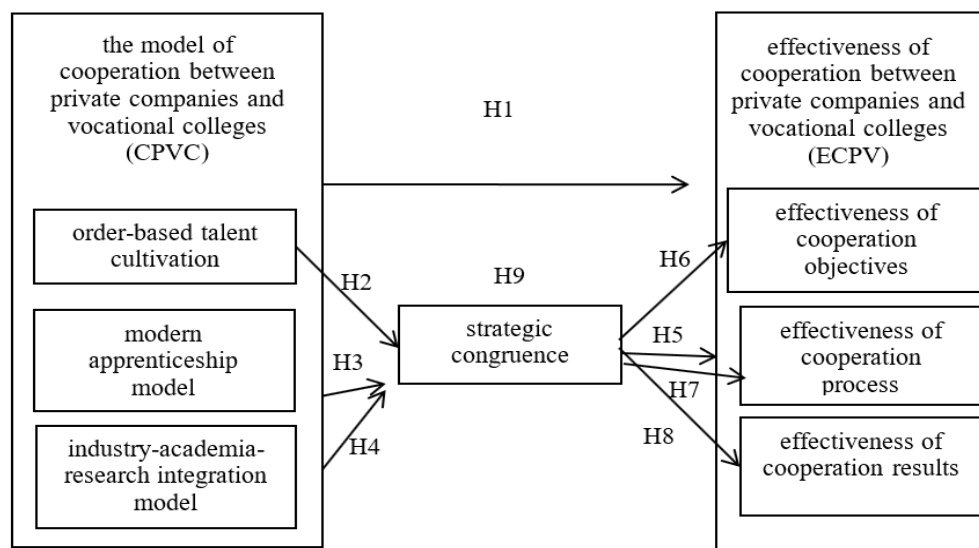
Figure 1.
Conceptual Framework.

3. Methodology

3.1. Research Design

This study adopts a quantitative cross-sectional design to investigate the factors influencing the effectiveness of cooperation between private enterprises and vocational colleges in China. Grounded in stakeholder theory and resource dependency perspectives, the research operationalizes key constructs Order-based Talent Training Model (OTM), Modern Apprenticeship Model (MAM), Industry-Academic-Research Integration Model (IAR), Strategic Coherence (SC), Effectiveness of Cooperation Objectives (ECO), Effectiveness of Collaborative Processes (ECP), and Effectiveness of Cooperation Results (ECR) through a structured questionnaire. The design integrates descriptive and inferential analyses to explore relationships between collaboration models and outcomes, leveraging reliability and validity tests to ensure methodological rigor. Stratifying samples across geographic regions (eastern,

central, western) and sectors like education technology, manufacturing and construction thereby thsi study captures heterogeneous dynamics in school-enterprise partnerships, addressing gaps in prior research that overlook contextual variability.

3.2. Population and Sampling

The target population comprises private enterprises and higher vocational colleges engaged in formal cooperation agreements, with a focus on enterprise managers, vocational educators, and administrative leaders. As illustrated in Table 1, the population was stratified into five entities: three private education firms (Beijing Xuezhirenhe International Education Investment Co., Aibangxue Beijing Education Technology Co., Shanxi Xuezhirenhe International Education Media Co.) and two vocational colleges (Shenyang Urban Construction University Vocational College, Taiyuan University of Technology Vocational College), collectively representing a total population of 1,930 stakeholders. A proportional stratified sampling technique was applied, yielding a final sample of 475 participants, with response rates ranging from 19% to 66% across subgroups. This approach ensured representation of diverse regional economic conditions and industrial priorities while mitigating selection bias.

Table 1.
Population and Sample Size of this Study.

Source Of Population	N	Percentage	Sample Size
Beijing Xuezhirenhe International Education Investment Co.	100	0.65	65
Aibangxue Beijing Education Technology Co.	80	0.66	53
Shanxi Xuezhirenhe International Education Media Co.	50	0.64	32
Shenyang Urban Construction University Vocational College	800	0.19	153
Taiyuan University of Technology Vocational College	900	0.19	172
Total	193		475

Table 1 shows population for this study comprises 1,930 stakeholders from three private education enterprises and two vocational colleges, reflecting regional diversity across Beijing, Shanxi, Shenyang, and Taiyuan. Stratified sampling ensured proportional representation: private enterprises, despite smaller population sizes (N = 100–80), contributed 32% of the sample (150 respondents), while vocational colleges, with larger populations (N = 800–900), constituted 68% (325 respondents). Notably, enterprises exhibited higher sampling rates (64–66%) compared to colleges (19%), likely due to targeted accessibility and engagement feasibility. For instance, Shenyang Urban Construction University Vocational College, representing the largest population (N = 800), contributed 153 respondents, aligning with its regional prominence in construction-related vocational training.

3.3. Data Collection

Data were collected via a self-administered questionnaire distributed electronically and in paper format to ensure accessibility across urban and rural regions. The survey instrument was pilot-tested with 30 participants to refine clarity and relevance, followed by a three-month deployment period to accommodate organizational workflows. To minimize non-response bias, reminders were issued at two-week intervals, and anonymity was guaranteed to encourage candid responses. The final dataset included 193 completed questionnaires, reflecting a 40.6% response rate. Demographic variables gender, age, education level, years of experience, and professional role and in paper format to ensure accessibility across urban and rural regions. The survey.

3.4. Instrument Deign

The questionnaire was structured into three sections: (1) screening questions to verify participants' direct involvement in school-enterprise partnerships; (2) demographic items to profile respondents; and (3) scale-based items measuring seven latent variables using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Scale development followed established protocols, with items adapted

from prior studies (e.g., A1–A5 for OTM, B1–B5 for MAM) and validated through expert reviews (Table 2). To enhance content validity, the instrument underwent iterative revisions based on feedback from vocational education specialists and corporate training managers, ensuring alignment with China's institutional context. For scale items and sources of information, Table 2 which shows the design of scale used in this study.

Table 2.
Scale Design of this Study.

Variables	Scale issues
Order-based Talent Training Model (OTM)	A1: The course content is highly relevant A2: Vocational skills improvement A3: On-site guidance from corporate mentors A4: Employment opportunities are closely related A5: Positive impact on long-term career development
Modern Apprenticeship Model (MAM)	B1: Combination of theory and practice B2: Significant improvement in professional skills B3: Corporate mentors help with professional development B4: Courses are consistent with vocational qualifications B5: Positive impact on future employment prospects
Integrated Industry-Academia-Research Model (IAR)	C1: High efficiency of knowledge transformation C2: Resources are fully shared C3: High satisfaction with cooperation projects C4: High degree of talent matching C5: Innovation capability enhancement
Strategic Coherence (SC)	D1: Alignment of strategic objectives D2: Develop a strategic plan together D3: Key decisions are consistent D4: Strategic adjustment understanding support D5: Education reform to match business needs D6: Develop long-term strategic considerations D7: Implement education plan considering demand D8: Reach a consensus on resource allocation and utilization D9: Develop a response strategy together D10: The strategic goals are advancing simultaneously
Effectiveness of Cooperation Objectives (ECO)	E1: Clear target E2: The goal is measurable E3: Understanding expectations together E4: Effective realization of goals E5: Guide strategic planning E6: The goal is challenging E7: Target timely adjustment
Effectiveness of Collaborative Processes (ECP)	F1: Communication is timely and effective F2: Clear and transparent decision-making F3: Resource allocation is well coordinated F4: Role responsibilities are clear F5: Problem resolved quickly F6: High flexibility F7: Monitoring and evaluation mechanism
Effectiveness of cooperation results (ECR)	G1: Achieve the desired result G2: The result quality meets the requirement G3: The actual application effect is good G4: The results are innovative G5: Students' knowledge and skills are improved G6: Positive contribution to the enterprise G7: Has long-term benefits

Table 2 explores different talent training models through a scale assessment which assesses their effectiveness in strategic coherence and collaboration objectives and processes and results in the

variables A1 through C5 for each model. The research utilizes A1–C5 variables to measure individual model performance yet evaluations regarding D1–G7 aspects examine compatibility together with goal definition and operational efficiency as well as effectiveness outcomes. These scales create a systematic method to determine the model effectiveness regarding skill development and industry applications and innovation ability and long-term advantages for students and businesses

3.5.1. Questionnaire Reliability Test
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Table 3.
Reliability Test for Questionnaire Related Variables.

Variables	Number of Items	Cronbach's α coefficient
OTM	5	0.825
MAM	5	0.836
IAR	5	0.823
SC	10	0.745
ECO	7	0.764
ECP	7	0.882
ECR	7	0.860
Total		0.922

Table 3 shows the "Cronbach alpha" which represents a well-known reliability test which appears in Likert attitude scales to assess their reliability. A scale demonstrates better stability when its reliability reaches higher levels. The questionnaire demonstrates excellent internal consistency because its variables achieve high Cronbach's α reliability scores. Each of the four variables consisting of order-based talent cultivation model, modern apprenticeship model and industry-university-research integration model together with effectiveness of cooperation process and effectiveness of cooperation results shows Cronbach's α coefficients above 0.8 which demonstrates strong item consistency within these variables. house strategic consistency along with effectiveness of cooperation goals present coefficients which surpass the acceptable threshold of 0.7 while remaining slightly below other variables. A high internal measurement consistency was verified through the overall Cronbach's alpha coefficient which reached 0.922.

Table 4.
Questionnaire Validity Analysis.

Variables	KMO	Bartlett's Test of Sphericity		
		Approx. Chi-Square	Df	Sig.
OTM	0.810	281.565	5	0.000
MAM	0.826	254.584	5	0.000
IAR	0.831	264.581	5	0.000
SC	0.875	297.481	10	0.000
ECO	0.844	218.486	7	0.000
ECP	0.821	226.152	7	0.000
ECR	0.869	231.475	7	0.000

Table 4 shows validity of each scale was analyzed by exploratory factor analysis using SPSS 26.0, and the reliability of the scale was thus tested. Firstly, KMO and Bartlett's Sphericity Test were conducted for each scale, when KMO value >0.7 and Bartlett's Sphericity Test <0.05, it means that the scale is suitable for factor analysis. The results of the validity test of this questionnaire scale are shown in Table 4, which indicates that the validity is good since the KMO value of each variable is greater than 0.7.

3.6. Data Analysis Techniques

Data analysis proceeded in three stages. First, descriptive statistics summarized demographic profiles and scale responses. Second, exploratory factor analysis (EFA) with SPSS 26.0 assessed construct validity, employing Kaiser-Meyer-Olkin (KMO) tests and Bartlett's sphericity criteria (Table 4); all variables met thresholds (KMO > 0.7, $p < 0.05$). Third, Cronbach's alpha coefficients evaluated internal consistency, with scores exceeding 0.7 for all constructs (Table 3), confirming reliability. Finally, multiple regression analysis explored predictive relationships between collaboration models (OTM, MAM, IAR) and effectiveness outcomes (ECO, ECP, ECR), controlling for strategic coherence (SC) as a mediating variable.

3.7. Ethical Considerations

Since the study followed ethical practices for social science research it obtained participant consent and protected privacy through data anonymization during information collection. The participants could choose whether to participate or not and specific options for opting out were clearly present. All data storage procedures followed protocols inspired by GDPR to secure authorized access and the study acquired required approvals from vocational colleges and enterprises. The survey instructions specifically aimed to distribute perspectives equally because of existing power imbalances between corporate managers and educators. Matters of potential conflict were minimized through the exclusion of research team-associated entities with financial relationships to the study

4. Findings

4.1. Sample Descriptive Statistics

The core role of descriptive statistics in research is to establish sample structure together with perception so scientists can confirm that findings apply beyond the sample. Statistics that detail essential characteristics of the participants including their professional functions, educational attainment and professional time spent confirm that the study sample accurately matches the active stakeholders who participate in school-enterprise partnership initiatives.

The data shows how participants distribute their answers regarding collaboration models together with effectiveness outcomes by displaying central measures and variability across each variable to demonstrate agreement and disagreement patterns between different groups. The distribution pattern across Likert-scale responses helps identify response outliers and skewed views that could reflect distinct partnership challenges or regional differences found in local sectors. The demographic profiling process ensures that the collected sample includes all types of Chinese vocational education institutions as they exist in private enterprise sectors and colleges from various geographical and financial circumstances. By performing this step researcher both confirm the high quality of their dataset while developing a structured approach to understand how different stakeholders perceive cooperation effectiveness through data analyses in representative scenarios.

Table 5.
Sample Descriptive Statistics.

Items	Form	Sample Size	Percentage
Gender	male	245	51.58%
	Female	230	48.42%
Age	20-30 years old	175	36.84%
	31-40 years	136	28.63%
	41-50 years	95	20.00%
	51 and over	69	14.53%
educational attainment	Undergraduate	200	42.11%
	Bachelor's degree	167	35.16%
	PhD and above	108	22.74%
years of experience	Less than 5 years	135	28.42%
	6-15 years	187	39.37%
	16-25 years	113	23.79%
	More than 25 years	40	8.42%
Nature of work	School administrators	260	54.74%
	School Teachers	215	45.26%

Table 5 presents descriptive statistics of the sample, the gender distribution is balanced with a slight male majority (51.58%). Age is mainly 20-40 (60%+), with some older respondents ensuring diversity. Educational attainment is balanced across bachelor's, master's, and doctoral degrees. Most respondents have 6-15 years of experience (39.37%), covering various career stages. School administrators and teachers each make up half the sample, enhancing study comprehensiveness. Overall, the sample is representative of the target group.

4.2. Correlation Analysis

The analysis of correlation serves as a fundamental method to identify both the strength and orientation between collaboration models including Order-based Training, Modern Apprenticeship and Industry-Academic-Research Integration and their resulting school-enterprise cooperation effectiveness. The examination of variable relationships enables identification of the strongest partnership frameworks that yield success through quantitative measurement of strategic coherence combined with process efficiency alongside tangible outcomes. The relationship between Industry-Academic-Research Integration and Effectiveness of Cooperation Results shows if innovative collaborative models deliver measurable quality of talent and research development outputs. The analysis of Strategic Coherence and Effectiveness of Collaborative Processes helps explain how goal alignment reduces operational problems between organizations. The correlation matrices function as a vital tool for identifying predictor multicollinearity issues (duplicative relationship between apprenticeship models and strategic planning) which allows researchers to maintain regression model validity. The assessment helps discover organizations that are directed through enterprise size and regional policies which creates an enhanced understanding of elements affecting collaboration results. The translation of theoretical constructs into statistical relationships through correlation analysis enables a connection from descriptive analysis to prescriptive strategies which supports policymakers and institutions in their effort to enhance partnership optimization.

Table 6.
Results of Pearson Correlation Analysis.

Relevant variables	Pearson's correlation coefficient	Sig.
CPVC→ ECPV	0.817	0.001
OTM→ SC	0.717	0.000
MAM→ SC	0.772	0.000
IAR → SC	0.833	0.001
SC → ECP	0.817	0.000
SC → ECO	0.786	0.000
SC → ECP	0.735	0.001
SC →ECR	0.827	0.000

Table 6 shows Pearson correlation analysis, there's a significant positive correlation between variables. The cooperation model between private enterprises and vocational colleges correlates highly (0.817) with cooperation effectiveness. The order talent cultivation model, modern apprenticeship model, and integration of production, learning, and research model also correlate highly (0.717, 0.772, 0.833) with strategic consistency, indicating they enhance it. Strategic consistency is crucial in the cooperation process, with correlation coefficients over 0.7 for cooperation effectiveness, goal effectiveness, process effectiveness, and result effectiveness, highlighting its key role in achieving goals, optimizing processes, and enhancing results.

4.3. Regression Analysis

The study relies on regression analysis to explore how collaboration models affect the predictive capabilities of strategic coherence regarding school-enterprise cooperation effectiveness results. This study uses multivariate modeling to link chosen partnership designs and strategic goal coordination with measurable outcomes which include talent quality and innovation production as well as process performance indicators. The analysis determines if the Industry-Academic-Research Integration Model creates added value to Effectiveness of Cooperation Results which exceeds apprenticeship programs results or Strategic Coherence works as a connecting factor between process collaboration and long-term outcomes. The model utilizes regression to identify the separate effects of each variable by taking into consideration enterprise size and regional policy environments and validates causal assumptions. The research findings verify the predicted pathways present in the strategic management model while pointing out specific options for practice like resource optimization and collaborative governance structure establishment to improve cooperation effectiveness. Through regression analysis policymakers and institutional leaders gain prescriptive evidence to strategically allocate resources which supports partnerships that follow China's industrial upgrading as well as educational modernization agendas.

Table 7.
Analysis of Regression Results for Each Variable.

	S C		CPVC			ECPV
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
constant	2.894	4.715	3.763	2.305	1.145	4.886
Control Variable						
Gender	0.124	0.006	0.032	0.036	0.152	0.045
Age	0.177**	0.033	0.128*	0.118	0.071*	0.085
Educational Attainment	0.021	0.036	0.020	0.015	0.521	0.049
Years Of Experience	0.091	0.089	0.071	0.021	0.058	0.028
Nature Of Work	0.156	0.116	0.076	0.055	0.050	0.122
Title	0.163**	0.001	0.104*	0.116**	0.095*	0.050**
Independent Variable						
School-Enterprise Cooperation Model		0.632**	0.513**	0.600*	0.573**	0.630**
intermediary variable						
Strategic coherence				0.600*		0.231*
F-value	3.506**	15.630	12.370**	20.365***	25.172**	22.490**
R²	0.450	0.367	0.204	0.263	0.362	0.493

Note: p-values less than 0.05 are labeled *; p-values less than 0.01 are labeled **

Table 7 shows the study utilizes regression models to demonstrate important relationships between cooperation determinants and effectiveness. School-Enterprise Cooperation Models create significant positive effects on strategic coherence (SC) and collaborative processes (CPVC) and effectiveness (ECPV) in all models (β = 0.513–0.632, p < 0.01).

Strategic Coherence functions as a mediatory variable that strengthens these effects since its introduction to Model 4 produced β = 0.600* and β = 0.231* in Model 6. This demonstrates that shared goals and combined organizational frameworks increase the conversion of partnership frameworks into substantial achievements. Perceptions of cooperative success are moderately influenced by workplace seniority and leadership positions identified through the control variables of Age (β = 0.177** in Model 1) and (β = 0.163** in Model 1). At the same time, demographic characteristics such as Age show minimal impact. R^2 values in models increased up to 0.493 in Model 6 indicating that the combination of strategic alignment with structured cooperation models produces the highest explanatory power. The hypothesis that strategic alignment functions as a mediator between partnership structures and performance gains validity based on significant F-measures (25.172** in Model 5). The research findings suggest that educational institutions need standardized adaptive governance frameworks to align corporate with educational priorities so school-enterprise collaborations create maximum financial benefits in vocational education.

4.4. The Mediating Role Test

Understanding how strategic coherence functions as a mediator establishes the causal relationship between various school-enterprise collaboration models and their performance effects. The research verifies strategic coherence as composed of aligned objectives and joint governance and adaptive planning functions as an intermediary tool which enables partnership effectiveness when using collaboration frameworks. The research adopts mediation analysis to recognize exclusively how strategic alignment contributes to the growth of talent quality and innovation outcomes. Policy-makers along with institutions must recognize this differentiation because substantial mediation effects dictate strategic coherence achievement has similar importance to implementation of collaboration models. The bootstrapping approach provides methodological solutions for small-to-moderate sample studies by reducing assumptions about normality distribution to ensure accurate indirect effect measurement. This empirical research demonstrates how strategic alignment between stakeholders creates substantial returns on investment in stakeholder partnerships through documented empirical evidence.

Table 8.
Analysis of Mediating Effects of Strategic Coherence.

Trails	Coefficient (β)	Standard Error (SE)	Bootstrapping (95% CI)	
			lower limit	limit
CPVC → ECPV	0.69	0.08	0.85	0.60
ECPV→ SC	0.67	0.05	0.57	0.77
SC → ECPV	0.47	0.04	0.58	0.36
ECPV→ SC→ECPV	0.31	0.05	0.41	0.24

Note: Boot standard errors, lower bounds on Boot CI, and upper bounds on Boot CI refer to the lower and upper bounds on the standard errors and 95% confidence intervals of the indirect effects estimated by the bias-corrected percentile Bootstrap method, respectively.

Table 8 shows Within the mediation analysis strategic coherence demonstrates meaningful mediation between collaborative processes (CPVC) and cooperation effectiveness (ECPV). Strategic coherence (SC) introduces an additional 31% of influence to enhance the relationship between CPVC and ECPV with β = 0.31 and 95% CI [0.24, 0.41]. Simultaneously, CPVC directly affects ECPV with a strong significant route of β = 0.69 and 95% CI [0.60, 0.85]. The data reveals that strategic alignment multiplies future effectiveness through simultaneous influence from effective processes to strategic alignment (β = 0.67) and then strategic alignment to future processes (β = 0.47).

Bootstrapped CIs demonstrate robust mediation between strategic coherence and cooperation outcomes since they exclude zero values (0.24–0.41 for the indirect effect). As a result, 31% of cooperation results depend on strategic coherence acting as a conduit. Collaborative models create successful outcomes although their success demands the implementation of organizational processes which connect objectives to adaptive governance structures. The results emphasize how practitioners should implement both structural frameworks (apprenticeships) and strategic dialogue platforms to keep long-lasting synergies active.

5. Discussion

The findings of this study advance the discourse on school-enterprise cooperation by empirically validating the mechanisms through which collaboration models and strategic coherence jointly determine partnership effectiveness, while contextualizing these dynamics within China's unique institutional landscape. Consistent with stakeholder theory [7, 17]. The regression results demonstrate that structured cooperation frameworks particularly the Industry-Academic-Research Integration Model exert a significant positive influence on outcomes such as talent quality and innovation output (β = 0.513–0.632, p < 0.01). This aligns with prior studies emphasizing resource dependency and joint governance as catalysts for synergy [23] yet extends these insights by quantifying the relative efficacy of models across heterogeneous sectors. For instance, the strong performance of innovation-driven collaborations contrasts with critiques of Germany's dual system, where rigid structures often hinder adaptability to technological shifts Muis and Isyanto [25] suggesting that China's hybrid state-market approach may offer flexibility advantages in fast-evolving industries.

Strategic coherence as a mediator (β = 0.31, 95% CI [0.24, 0.41] explains the fundamental deficiency in past research which shows that collaboration structures succeed only when backed by formal systems for goal unification and adaptive planning alongside conflict resolution. The research findings demonstrate the influence of institutional theory through its explanation of organizational pressures Indrawati and Kuncoro [27] while illustrating how stakeholders actively implement policy requirements at the organizational level. The results affirm how strategic coherence and process effectiveness influence each other (ECPV → SC: β = 0.67 and SC → ECPV: β = 0.47) which supports [28] view of trust-building and communication as cyclical instead of linear processes that static policy analyses fail to capture. The insignificant role of gender and education variables when examining cooperation results in China contradicts Western research that concentrates on individual variables

[29] yet demonstrates China's traditional collective emphasis on institutional factors within its vocational realm.

Al-kassem [30] recommends context-sensitive models which contradict the Eurocentric frameworks that researchers wish to import. The leadership roles used as a moderator ($\beta = 0.163**$, $p < 0.01$) confirms worldwide ideas about intermediary empowerment to handle power inequality between stakeholders Chatterjee, et al. [31] demonstrating universal principles in partnership management.

5.1. Policy Implications

Results from this study demand China needs to readjust vocational education policy to make strategic coherence foundational for school-enterprise partnership development at all levels of operational activity. The tested link between strategic alignment requires policy changes to the Vocational Education Promotion Law by creating boards of enterprise leaders alongside academic administrators and regional policymakers to develop expert frameworks and check partnership achievements as well as using feedback systems for continuous improvement. The government should introduce multi-level tax incentives and subsidies matched with predefined strategic performance metrics for businesses to encourage long-term involvement in strategic outcomes such as patented co-developments and graduate placements in strategic sectors which follow Germany's approach to apprenticeships combined with China's flexible market-oriented structure. Academic institutions need to implement flexible accreditation frameworks which evaluate curricula by the extent of enterprise involvement and technology transfer activities like TAFE Australia while arbitration bodies should implement standard rules for intellectual property (IP) profit distribution to prevent issues that limit high-tech collaboration.

6. Conclusion & Recommendations

This study explores how effective cooperation between private enterprises and colleges is influenced by the model of cooperation. It analyses the mediating role of strategic consistency in this process. Extensive data on school-enterprise cooperation was collected using a questionnaire survey method. The study shows how cooperation between private enterprises and higher vocational colleges and universities can be made more effective. Different models of cooperation promote cooperation and communication between schools and enterprises and enhance the effectiveness of cooperation. These models of cooperation optimize the allocation of resources, enhance interaction and promote technological innovation. Strategic alignment is important for cooperation effectiveness. When aligned, enterprises and schools are more likely to form a close cooperative relationship and work together to address challenges. Strategic alignment improves the stability and sustainability of school-business cooperation and promotes improved effectiveness.

This study explores the impact of cooperation model and strategic consistency between private enterprises and higher vocational colleges and universities through a questionnaire survey, providing useful support and practical implications. In a rapidly changing market and technological innovation era, deepening cooperation between private enterprises and colleges is crucial. Enterprises can invest in advanced equipment and technology for joint training bases, while colleges provide space and manpower. Students can engage with cutting-edge production processes, enhancing practical skills. Joint R&D projects leverage college theory and enterprise practice/funds to tackle industry challenges. Technology transfer turns research into productivity, boosting competitiveness. These models integrate resources to meet training needs and improve efficiency. Strategic synergy and planning are vital for school-business cooperation. Regular strategy seminars help share industry news, market changes, and development strategies, fostering understanding and planning. Clear, phased goals (e.g., curriculum development, internship bases, talent output) ensure both sides have clear paths. This synergy ensures close links, resource deployment, and mutual benefit in the face of market challenges. A cooperative and protected partnership between schools and businesses is essential. Contracts define rights, duties, training responsibilities, and quality standards. A management organization improves efficiency, while

communication channels facilitate progress updates and problem-solving. Policy support, such as tax relief and subsidies, creates a favorable environment, promotes deep cooperation, and continuously supplies high-quality talent to meet industrial upgrading demands.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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